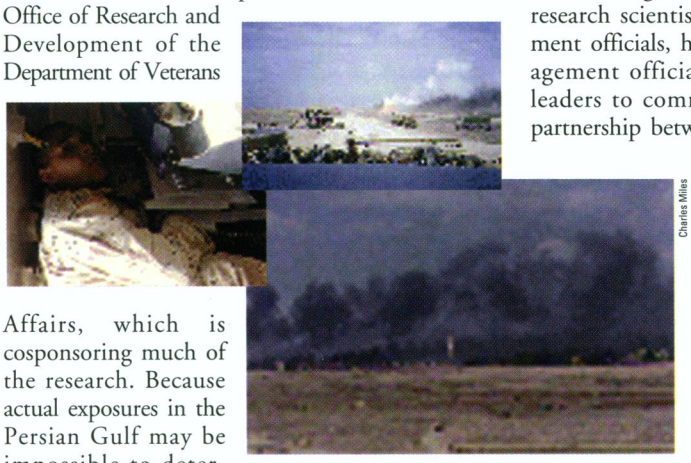
reexamining the Edgewood subjects.

The point of all this research is to uncover plausible biological explanations, said Timothy R. Gerrity, special assistant to the chief research and development officer in the Office of Research and Development of the Department of Veterans Affairs, which is cosponsoring much of the research. Because actual exposures in the Persian Gulf may be impossible to determine, said Gerrity, "The question of causation will probably be with us for decades, if not forever." There is also a third set of DoD-sponsored studies costing $5 million that may matter most in the long term. The topic, says Friedl, was inspired by recent research showing that U.S. soldiers from every war from the Civil War through Vietnam have suffered a constellation of symptoms much like those of the Gulf War vets. The DoD is looking for information on the long-term effects of stress on soldiers and ways to reduce the effects, such as debriefing techniques and the use of drugs used to treat rape victims, Friedl says. "This is probably something with a high prevalence and something that we need to understand," he says, "so we don't see Bosnia War Syndrome next."



Charles Miles

Middle East mystery. Despite a growing cloud of controversy, researchers continue to investigate links between chemical exposures and Gulf War illnesses.

A Decade of Cleanup Research

A woman's risk of breast cancer may depend on where she lives, according to Ann Aschengrau, associate professor of epidemiology and biostatistics at Boston University. Aschengrau is conducting a case–control study of breast cancer in Cape Cod, Massachusetts, where the incidence rate surpasses that expected from established risk factors, such as age and family history. Surprisingly, the added risk may come from vinyl-lined water pipes that, during the 1960s and 1970s, leached perchloroethylene (PCE), a common commercial solvent. Aschengrau reported preliminary results at a meeting held 23–26 February that suggest a link between PCE-contaminated drinking water and an increased risk of breast cancer.

The meeting, Superfund Basic Research Program: A Decade of Improving Health through Multidisciplinary Research, was sponsored by the NIEHS and hosted by the University of North Carolina at Chapel Hill. The meeting attracted more than 400 research scientists, students, government officials, hazardous waste management officials, and community leaders to commemorate a 10-year partnership between the NIEHS and the EPA aimed at solving hazardous waste problems.

The Superfund Basic Research Program was established in 1986 to conduct research on the risk to humans from hazardous waste and to develop new technology to remediate contaminated sites. The February meeting was the first of its kind to bring together scientists from diverse areas including molecular biology, toxicology, epidemiology, ecology, geology, and engineering to address problems posed by hazardous substances in the environment.

Meeting presentations, including approximately 200 poster presentations, were designed to represent different facets of the Superfund Basic Research Program. Presentations covered a wide variety of hazardous waste-related topics, from detection and correction of contamination to the impact of hazardous waste on minority and disadvantaged communities. In one presentation, Howard Hu, associate professor of occupational and environmental medicine at the Harvard School of Public Health, described his X-ray fluorescence measurements of lead in bone. "The level of lead in someone's bones tells us about that person's cumulative exposure to lead over decades," Hu said. "Our research suggests that high bone lead is a risk factor for hypertension, kidney impairment, anemia, and, among pregnant women, low birthweight in their offspring."

In many cases, however, investigators lack the necessary data to determine the health risks posed by exposure to a chemical or compound. James Sherman, senior toxicologist at Monsanto Company, said, "There will always be data gaps and uncertainty." But, he added, "It is imperative that we find better methods to quickly use current and emerging knowledge to provide best estimates of toxicity rather than simply using a series of defaults to provide upper-bound estimates until all data gaps are filled beyond question." Sherman acknowledged that the EPA is working on this problem, and commented, "While improvements are being evaluated, we are experiencing a 'paralysis by analysis' where in the last three to five years very few new studies have been used to update [EPA-] approved toxicity criteria." He encouraged his colleagues to "get the science to the users in a usable form."

Nevertheless, Stephen Luftig, director of the EPA's Office of Emergency and Remedial Response, pointed out that many cleanup sites present complex problems—ones that require multidisciplinary knowledge, which cannot always be mobilized instantly. In addition, William Thilly, program director of the MIT Superfund Hazardous Substances Basic Research Program, warned that scientists should put high priority on proper remediation.

In addition to monitoring and risk assessment, hazardous-waste research should lead to cleanups. In some situations, nature may provide solutions. For example, Milton Gordon, professor of biochemistry at the University of Washington in Seattle, reported on the use of hybrid poplar trees to bioremediate soils contaminated with trichloroethylene and carbon tetrachloride. This approach could be widely used, Gordon added, because the more than 25 species of poplar are easy to cultivate, survive in a wide geographic distribution, and grow from 3 to 5 meters each year. Moreover, they could eventually be harvested for paper or biofuel.

Ultimately, continued research on hazardous waste may depend on Congress. Superfund legislation expired in 1994, and the tax that helped finance Superfund cleanups expired in 1995. Although proposals before Congress include funding for Superfund-related research as well as reauthorizing Superfund legislation, Congressman David Price (D-North Carolina) said, "The budget proposals are anything but a done deal, and also, reauthorization itself is an uphill battle."

Despite the uncertainty of future funding, William Suk, program director of the Superfund Basic Research Program at the NIEHS, laid out a series of challenges including training more scientists to work in the field of hazardous waste, advancing risk assessment—especially for children—and learning more about the risks from exposures to mixtures of chemicals. In addition, Suk told meeting participants, "We need to translate our research results better," by telling the public what is being done and why it matters.